

SEVERE LOCAL STORMS

[Compiled by Mary O. Souder from reports submitted by Weather Bureau officials]

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Union County, N. Mex., northern portion.	1-3				\$70,000	Severe rains	Considerable damage to buildings, fences, highways, bridges, and spreader dams. Loss in unthreshed alfalfa seed, \$10,000; and to prospective crops, \$8,000.
Clearmont, Wyo.	3				25,000	Hail	Loss to crops, \$10,000.
Meredosia, Ill.	6				8,000	do	Property damaged.
South Holland, Ill., vicinity of.	6				170,000	Wind	Property damage, \$150,000; loss to crops, \$20,000. This storm covered an area of 4 miles to southwest and northeast.
El Paso, Tex. ¹	13	P. m.		0		Tornado, rain, and hail.	Funnel-cloud observed. Rain recorded at the city office of the Weather Bureau during the 24 hours ending 7 p. m. There was a brisk spatter of hail in the Country Club district and some other areas about noon.
Holdenville, Okla.	28	8:12 a. m.	100	0	10,000	Tornado	Storm moved from southwest to northeast. Many homes and commercial establishments damaged. Trees blown down; communication lines disrupted. Slight crop loss due to the fact the tornado did not strike in the rural districts. A person injured; path 880 yards long.
Marshalltown, Iowa	28				1,000	Wind	Property damaged.
Lynn to Lubbock Counties, Tex.	30	2 p. m.	13		107,000	Heavy hail	This storm covered an area 3 by 25 miles along the northern edge of Lynn County and extending into extreme southeastern Lubbock County caused property damage of \$85,000, and crop loss of \$22,000. Most of the crop damage occurred in the vicinity of Slaton, Lubbock County.
Chambers, Hardin, Harris, Jefferson, Liberty, and Orange Counties, Tex.	31	11:30 a. m.	175	1	134,000	Straight-line wind.	Widespread damage. A man killed when blown from top of an oil derrick. Crop loss, \$13,000; property damage, \$121,000.
Fredericksburg, Tex., vicinity of.	31			0		Tornado	4 houses wrecked.

¹ Miles instead of yards.² From press reports.

SOLAR RADIATION AND SUNSPOT DATA

SOLAR RADIATION OBSERVATIONS

By HELEN CULLINANE

Measurements of solar radiant energy received at the surface of the earth are made at 9 stations maintained by the Weather Bureau, and at 10 cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Washington D. C., Madison, Wis., Lincoln, Nebr.) and at the Blue Hill Observatory at Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau stations at Washington and Madison.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data obtained, up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, pp. 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parentheses). At Lincoln the observations are made with the Marvin pyrheliometer; at Washington, Madison, and Blue Hill they are obtained with a recording thermopile, checked by observations with a Smithsonian silver-disk pyrheliometer at Washington and Blue Hill. The table also gives vapor pressures at 7:30 a. m. and at 1:30 p. m. (75th meridian time).

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, their departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of the Eppley pyrheliometer recording on either a microammeter or a potentiometer.

Owing to the transfer of the Solar Radiation Investigations Supervising Station from Washington, D. C., to Blue Hill Observatory at Milton, Mass., early in November,

about which details will appear in the next issue of the REVIEW, the data for both September and October are combined in this issue.

It will be noted that measurement of normal incidence solar radiation intensities for Washington, D. C., was abandoned after September, due to the transfer mentioned above.

Direct solar radiant energy was considerably above normal at Blue Hill in October, while it was below normal during September at Madison, Blue Hill, and Washington.

During September total solar and sky radiation was considerably below normal at Miami and Lincoln, practically normal at Blue Hill, and excessive at all other stations. During October it was normal at La Jolla and Miami, and considerably excessive at Chicago, New York, and New Orleans. The equipment was broken down at Friday Harbor during September and at Lincoln during October, but has now been repaired at both stations.

Polarization observations made at Madison on 6 days give a mean of 55 percent for September, with a maximum of 71 percent on the 25th. The mean is somewhat below the September normal. Observations on 4 days in October, give a mean of 59 and a maximum of 70 on the 15th.

TABLE 1.—Solar radiation intensities during September 1940
[Gram=calories per minute per square centimeter of normal surface]

WASHINGTON, D. C.

Date	Sun's zenith distance										Local mean solar time
	7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass									
		A. M.					P. M.				
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
Sept. 17	Mm.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Mm.
Sept. 18				0.66	0.77						
Sept. 20					.84						
Sept. 22					.74						
Sept. 26					.89						
Sept. 27					1.44						
Sept. 28					1.42						
Sept. 29					.99						
Means				(.66)	.90	(1.43)					
Departures				-.21	-.14	+.11					

TABLE 1.—Solar radiation intensities during September 1940—
Continued
MADISON, WIS.

Date	Sun's zenith distance										Local mean solar time	
	7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°		1:30 p. m.
	75th mer. time	Air mass										
		A. M.					P. M.					
		e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0		5.0
	<i>Mm.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Mm.</i>	
Sept. 3.	10.97	0.54	0.64	0.74							11.38	
Sept. 4.	10.59	.42	.53	.62	0.92						13.13	
Sept. 5.	10.97	.38	.42	.55	.74	1.11					12.68	
Sept. 10.	5.36	1.02	1.15	1.19							4.95	
Sept. 11.	5.36			1.11							6.02	
Sept. 20.	12.68	.71	.83	.92	1.11	1.32					15.11	
Sept. 25.	4.57	1.03	1.16	1.28	1.43	1.54					4.17	
Sept. 26.	4.37	.98	1.10	1.18	1.37	1.52	1.16				5.16	
Sept. 27.	5.16	.76	.92	1.08	1.25	1.55					5.16	
Means73	.84	.96	1.14	1.41	(1.16)					
Departures		-.04	-.04	-.04	-.01	+.02	-.03					

BLUE HILL, MASS.

Sept. 3	14.3			0.64	0.89	1.13	1.37	1.61	1.85	2.09	2.33	12.8
Sept. 4	11.1		0.64	.80	1.00	1.24	1.48	1.72	1.96	2.20	2.44	11.9
Sept. 5	10.7				.92	1.16	1.40	1.64	1.88	2.12	2.36	10.7
Sept. 6	8.6	0.80	.94	1.06	1.18	1.30	1.42	1.54	1.66	1.78	1.90	7.9
Sept. 8	6.6			1.08	1.25	1.45	1.65	1.85	2.05	2.25	2.45	6.9
Sept. 12	8.8	.80	.91	1.06	1.22	1.40	1.58	1.76	1.94	2.12	2.30	9.2
Sept. 13	8.2	.70	.80	.98	1.17	1.43	1.68	1.93	2.18	2.43	2.68	8.6
Sept. 14	8.6	.89	.95	1.09	1.23	1.41	1.59	1.77	1.95	2.13	2.31	9.6
Sept. 18	9.6				1.02	1.26	1.50	1.74	1.98	2.22	2.46	11.5
Sept. 20	10.7	.68	.69	.83	1.02	1.22	1.46	1.70	1.94	2.18	2.42	10.5
Sept. 22	11.9	.61	.73	.91	1.07	1.25	1.42	1.60	1.78	1.96	2.14	7.4
Sept. 23	7.1	.90	1.00	1.10	1.25	1.42	1.59	1.76	1.93	2.10	2.27	10.3
Sept. 25	15.3	.94	1.05	1.18	1.34	1.54	1.72	1.90	2.08	2.26	2.44	3.8
Sept. 26	4.2				1.02	1.22	1.46	1.70	1.94	2.18	2.42	6.1
Sept. 27	4.6	.88	.97	1.09	1.22	1.46	1.70	1.94	2.18	2.42	2.66	6.8
Sept. 28	6.3	.77	.88	.99	1.20	1.43	1.65	1.87	2.09	2.31	2.53	7.4
Sept. 29	7.4	.73	.84	.97	1.13	1.35	1.57	1.79	2.01	2.23	2.45	
Means		.78	.87	.98	1.12	1.42	1.68	1.94	2.20	2.46	2.72	
Departures		-.03	-.05	-.04	-.02	+.05	+.01	-.05	-.06	-.07	-.07	

Solar radiation intensities during October 1940

BLUE HILL, MASS.

Oct. 2	7.9			1.21	1.34	1.51	1.68	1.85	2.02	2.19	2.36	9.2
Oct. 5	6.1	0.85	.94	1.06	1.24	1.42	1.60	1.78	1.96	2.14	2.32	6.5
Oct. 7	11.1				.94	1.10	1.26	1.42	1.58	1.74	1.90	11.9
Oct. 9	7.6					.99	1.16	1.32	1.48	1.64	1.80	6.1
Oct. 10	5.2					.94	1.10	1.26	1.42	1.58	1.74	5.4
Oct. 11	5.6	.93	1.04	1.17	1.32	1.47	1.62	1.77	1.92	2.07	2.22	5.8
Oct. 12	7.4				.94	.84	.79	.71	.63	.55	.47	7.6
Oct. 13	9.6	.54	.66	.82	.99	1.16	1.33	1.50	1.67	1.84	2.01	9.6
Oct. 14	5.6	.94	1.04	1.06	1.29	1.50	1.71	1.92	2.13	2.34	2.55	4.0
Oct. 15	11.9				.99							9.2
Oct. 18	5.4	.97	1.09	1.26	1.40	1.57	1.73	1.89	2.05	2.21	2.37	3.8
Oct. 19	2.0	1.05	1.13	1.26	1.40	1.57	1.73	1.89	2.05	2.21	2.37	1.4
Oct. 20	2.4		1.13				1.19	1.04	.93	.81	.70	2.6
Oct. 21	3.2						1.24	1.06	.95	.84	.73	2.0
Oct. 22	2.3	1.08	1.16	1.26	1.37	1.55	1.73	1.91	2.09	2.27	2.45	1.8
Oct. 23	3.8	.68	.81	.91	1.07	1.25	1.43	1.61	1.79	1.97	2.15	6.1
Oct. 24	7.9	.32	.44	.68	1.20	1.51	1.81	2.11	2.41	2.71	3.01	3.3
Oct. 25	4.4											4.8

TABLE 2.—Average daily totals of solar radiation (direct + diffuse) received on a horizontal surface
(Gram-calories per square centimeter)

Week beginning—	Wash- ington	Madi- son	Lin- coln	Chi- cago	New York	Fresno	Fair- banks	La Jolla	Miami	New Orleans	River- side	Blue Hill	New- port	Friday Harbor	Cam- bridge	Albu- querque
Sept. 3	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
Sept. 10	530	449	382	385	445	550	230	519	253	406	383	319	451	355	365	584
Sept. 17	442	391	354	347	365	534	159	477	368	543	472	373	423	379	379	594
Sept. 24	601	343	296	380	375	518	201	374	281	329	479	369	423	379	379	391
Oct. 1	413	402	318	349	347	498	156	439	369	446	462	365	423	379	379	492
Oct. 8	332	315		298	290	453		365	385	436	408		267	241	312	470
Oct. 15	332	297		253	323	428		419	375	441	395		335	173	309	380
Oct. 22	244	295		222	290	350		364	410	418	375		289	151	289	477
Oct. 29	241	200		195	288	301		320	345	310	301		302	150	280	410

DEPARTURES FROM WEEKLY NORMALS

Sept. 3	+137	+71	-92	+36	+110	-24	+30	+43	-155	+53	-6	+48				
Sept. 10	+70	+49	-75	+34	+43	-2	-44	-3	-42	+183	-47	-41				
Sept. 17	+131	-4	-126	+46	+69	+23	+33	-25	-136	-43	+50	+31				
Sept. 24	+64	+103	-59	+70	+63	+42	+24	+69	-12	+69	+54	+27				
Oct. 1	+3	+35		+42	+5	+24		-29	-14	+76	+25	-42	-18			
Oct. 8	+23	+50		+30	+52	+21		+31	+7	+87	+18	+53	-57			
Oct. 15	-51	+71		+19	+59	-24		-4	+48	+94	+19	-15	-40			
Oct. 22	-20	-6		+20	+90	-50		+1	-40	-15	-49	+17	-3			

ACCUMULATED DEPARTURES ON OCTOBER 28

+6,545	+5,761	-----	+5,407	+9,758	-546	-----	-4,060	-2,520	+11,139	-----	-----	-2,041	-----	-----	-----	-----
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Solar radiation intensities during October 1940
BLUE HILL, MASS.—Continued

Date	Sun's zenith distance											Local mean solar time
	7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.	
	75th mer. time	Air mass										
		A. M.					P. M.					
		e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	
Oct. 26	Mm.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Cal.	Mm.	
Oct. 27	5.0	.76						1.20	1.11	.99	4.4	
Oct. 28	2.9							1.12	1.12	.99	2.9	
Oct. 28	2.4	1.06	1.16	1.26	1.41	1.59	1.40	1.22	1.12	1.03	2.0	
Oct. 29	2.9	1.02	1.12	1.23	1.35	1.50	1.33	1.15	1.01	.88	3.3	
Oct. 31	6.1							.95	.78	.69		
Means		.84	.98	1.07	1.24	1.50	1.22	1.06	.94	.84		
Departures		-.05	+.02	-.02	+.01	+.12	+.02	+.04	+.02	+.05		

MADISON, WIS.

Oct. 2	5.79		0.80	0.95	0.99	1.39	1.31	1.39			9.47
Oct. 7	7.04	0.87	1.01	1.15	1.14	1.48					10.21
Oct. 8	5.16	.85	.98	1.12	1.27	1.48	1.26				5.36
Oct. 9	5.56		.86	1.01	1.19	1.35	1.19				5.79
Oct. 15	4.37	1.01	1.12	1.22	1.42	1.60	1.38				7.57
Oct. 17	5.36	.41	.58	.69	1.06	1.65					5.36
Oct. 30	5.79	.65	.95	1.11	1.32	1.56					9.47
Means		.76	.90	1.04	1.20	1.50	1.28				
Departures		-.03	-.02	0	0	+.06	+.07				

LINCOLN, NEBR.

Oct. 7	6.02				1.32	1.58					5.79
Oct. 11	6.76				1.32	1.59			1.02	0.90	6.76
Oct. 16	4.37				1.36	1.59		1.68	.80	.78	6.27
Oct. 17	4.57				1.36	1.57					3.15
Oct. 25	4.57							1.08	.89	.78	11.38
Oct. 26	8.81				1.20	1.37					9.47
Means					(1.20)	1.35	1.58	(1.08)	.95	.84	
Departures					+.11	+.07	+.09	+.01	+.01	+.01	

LATE REPORT

Solar radiation intensities during August 1940
BLUE HILL, MASS.

August 2	10.3	0.66	0.77	0.91	1.09	1.42	1.41
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